Multiple births and the Risk for Birth Defects in Michigan

1998-2002 Michigan Birth Defects Registry

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Birth Defects Background (1)

- Affect approximately 3-4% of all live births
- About 150,000 babies are born each year with birth defects
- Associated with adverse outcomes
  - High infant mortality
  - Pediatric hospitalizations
- About 2/3 of all birth defects from unknown causes

Birth Defects Background (2)

- Birth defects are generally grouped into three major categories:
  - Structural/metabolic
  - Congenital infections
  - Other conditions

Structural and Metabolic Abnormalities

- **Structural birth defects**: some part of the body (internal or external) is missing or malformed
  - Heart defects are the most common type, affecting one baby in 125
  - Spina bifida (open spine, in which the backbone never completely closes and the spinal cord is usually malformed) affects one in 2,000 babies
  - About one baby in 135 has a structural defect involving the genitals or urinary tract
- **Metabolic disorders** affect one in 3,500 babies. These disorders are not visible, but can be harmful or even fatal. Most are recessive genetic diseases.

Congenital Infections

- **Rubella (German measles):** probably is the best known congenital infection that can cause birth defects
  - one-in-four chance of being born with one or more features of congenital rubella syndrome (deafness, mental retardation, heart defects, blindness) if infection occurred in first trimester
  - rare due to widespread vaccination
- **Cytomegalovirus (CMV):** most common congenital viral infection.
  - About 1 percent (40,000 babies a year) of all newborns in this country are infected: about 10 percent of them (3,000-4,000) have serious consequences, including mental retardation, and loss of vision and hearing
  - Pregnant women often acquire CMV from young children, who usually have few or no symptoms
- **Sexually transmitted infections** in the mother can affect the fetus and newborn: untreated syphilis can result in stillbirth, newborn death, or bone defects. About one baby in 2,000 is affected

Other conditions

- **Fetal alcohol syndrome**, which affects one baby in 1,000. This pattern of mental and physical birth defects is common in babies of mothers who drink heavily during pregnancy. Even moderate or light drinking during pregnancy can pose a risk to the baby
- **Rh disease** of the newborn, which is caused by an incompatibility between the blood of a mother and her fetus, affects about 4,000 infants a year. It can result in jaundice (yellowing of the skin), anemia, brain damage and death
- **Babies of mothers who use cocaine** early in pregnancy may be at increased risk of birth defects. A large study has suggested that these babies are five times more likely to be born with urinary tract defects than babies of women who don't use cocaine *(March of Dimes web site)*

Michigan Birth Defects Registry (MBDR): Key facts (1)

- Michigan's formal surveillance system for monitoring the occurrence of birth defects began in 1987 when the public health code was amended by Act 48 to require establishment of a birth defects registry
- The legislation was subsequently updated by Act 236 of 1988 which reflects the current law on birth defects reporting
- State wide reporting began in 1992: *Confidential passive statewide surveillance system*
- Defined List of Reportable Conditions

Michigan Birth Defects Registry (MBDR): Key facts (2)

- Any child before 24 months of age
- Must be reported within 30 days of diagnoses
- Must be Michigan resident
- Identified by ICD9 code and grouped by diagnostic category

Michigan Birth Defects Registry (MBDR): Sources of Information

- Hospitals
- Cytogenetics labs
- Genetic Clinics
- Birth and Death Data
- Stillbirth Data
- Metabolic/Hearing Screening

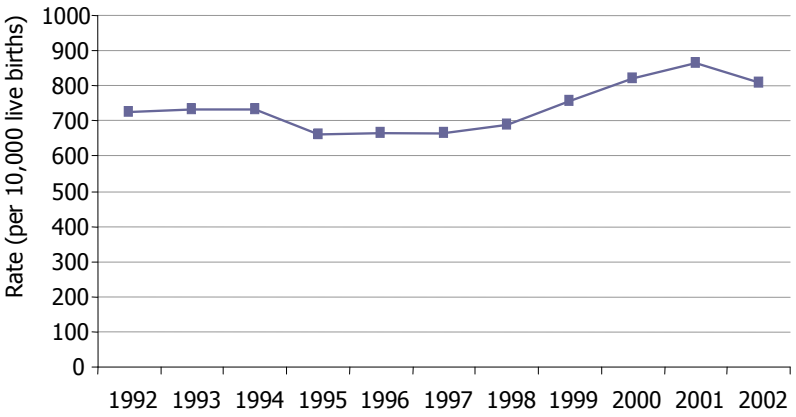
Michigan Birth Defects Registry (MBDR): Statement of Purpose

- Provide data on incidence of birth defects in Michigan
- Enable surveillance of birth defects
- Enable epidemiological studies on the causes of birth defects
- Assure that children with birth defects and their families receive appropriate support services
- Utilize to:
  - Improve service planning
  - Improve knowledge
  - Promote prevention

Michigan Birth Defects Registry (MBDR): Current Status

- Processed 288,000 reports
- Registry contains 144,000 children
- Includes 6,900 deaths
- Data on birth defects from 1992 through 2002

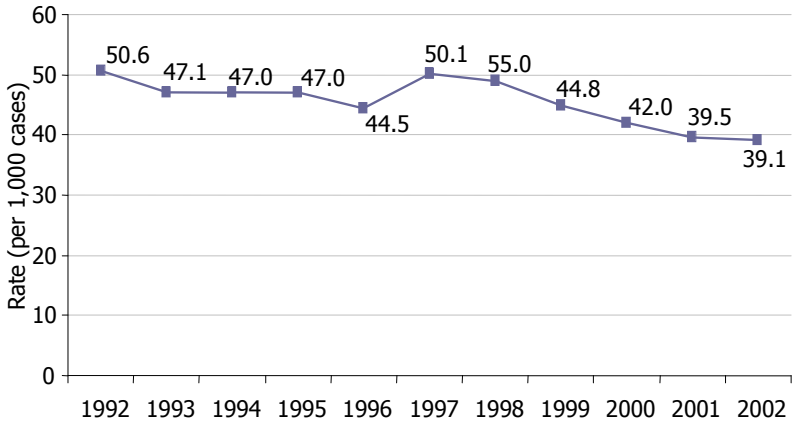
Birth Defects Trends in Michigan, 1992-2002



Changes in prevalence of Birth Defects in Michigan, 1992-2002

- The overall prevalence rate of birth defects has been increasing from 726.8/10,000 in 1992 to 810.2/10,000 in 2002 with an average of 738.8/10,000 in this eleven-year time frame
- An increase in prevalence rates was also observed in the three organ systems affected by the highest number of birth defects:
  - heart and circulatory (129.8/10,000 in 1992 to 166.8/10,000 in 2002)
  - musculoskeletal (147.7/10,000 in 1992 to 162.4/10,000 in 2002)
  - genitourinary (101.2/10,000 in 1992 to 113.8/10,000 in 2002)
- The increase may be attributed to better surveillance procedures and reporting

Birth Defects Mortality Rate for Infants, 1992-2002



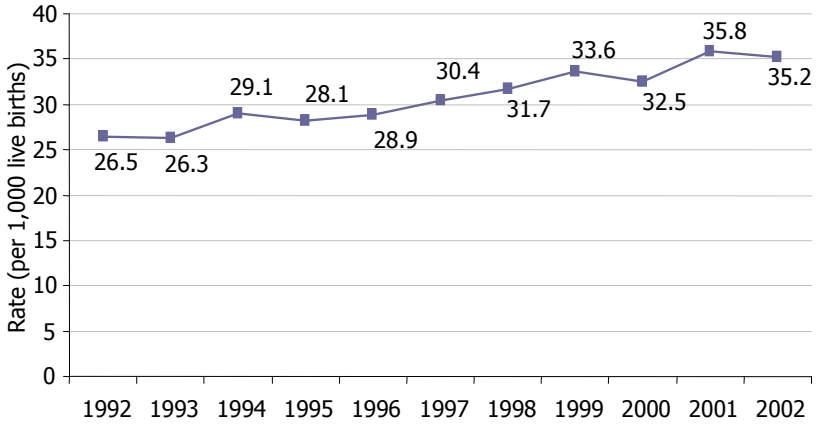
Multiple Births Background (1)

- In 2002, over 130,000 multiple births were recorded in the US
- Rates vary by maternal race and age
- National data (National Center for Health Statistics):
  - Twins
    - Birth rate of twins risen 65% since 1980
    - The 2002 rate: 31.1 / 1,000 live births
  - Triplets or more
    - Birth rate risen over 400% since 1980
    - Since 1998, rate has slowed
    - The 2002 rate: 184.0 / 100,000 live births in 2002

Multiple Births Background (2)

- Risk of Multiple births increases with:
  - Advanced maternal age
  - High parity
  - Use of fertility treatments
  - Family history
- Multiple births are more likely to:
  - Be born preterm
  - Have low birthweight
  - Have congenital anomalies
  - Be stillborn

Multiple Birth Rates in Michigan, 1992-2002



Study Objective

- To describe the characteristics of women who have infant/s from multiple birth pregnancies born with a birth defect between 1998-2002
- To explore the association between birth defects and multiple births

Methods (1)

- MBDR data from 1998-2002
- Birth defects classified by systems and only the six most prevalent included:
  - Heart and circulatory system (Heart)
  - Respiratory system (RS)
  - Central nervous system (CNS)
  - Musculoskeletal (MS)
  - Genital and urinary system (GUS)
  - Alimentary canal/Digestive System (UADS)

Methods (2)

- Calculate birth defects prevalence rates per 10,000 live births
- Prevalence stratified by:
  - Maternal age
  - Maternal race
  - Gestational age
- Impact of multiple births on birth defects measured by Risk Ratio and Attributable Risk
- Excel and SAS 9.1 software used for analysis

Risk Ratio and Attributable Risk Definition

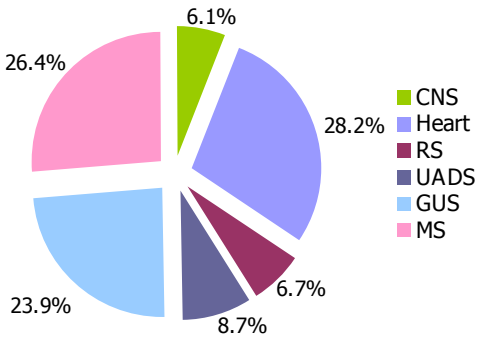
- Risk Ratio or Relative Risk: the ratio of the risk of disease or death among the exposed to the risk vs. the unexposed
- Attributable Risk: the rate (proportion) of a disease or other outcome in exposed individuals that can be attributed to the exposure

Results

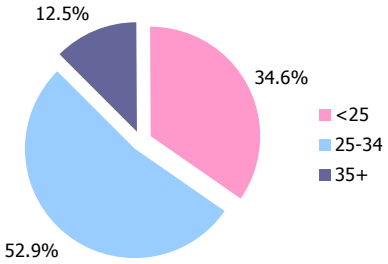
- 31,167 cases of birth defects identified between 1998-2002
- 159.2/10,000 prevalence rate of birth defects among the study population
- 1,909 were multiple births (6.1%) among birth defects cases

Most Prevalent Birth Defects

- Top 3 birth defects in study population
  - Heart/circulatory system
  - Musculoskeletal system
  - Genitourinary system

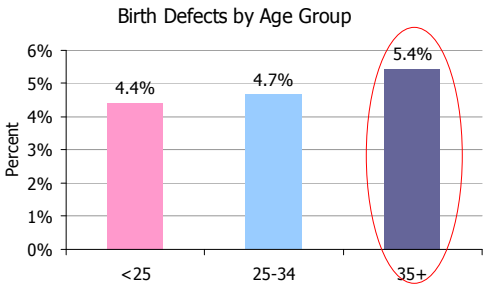


Birth Defects by Age

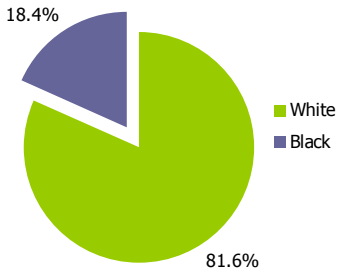


- About 12.5% of women 35 and older gave birth between 1998-2002

- This age group had the highest prevalence of birth defects

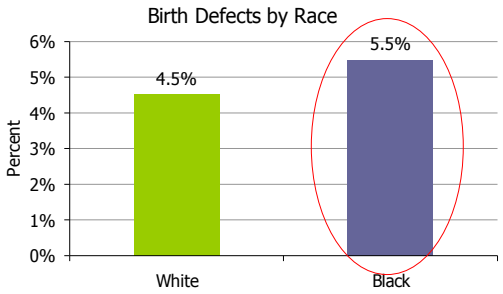


Birth Defects by Race

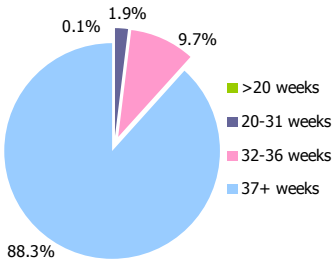


- Among the sample population, over 80% of the women were White

- About one percent more Black women gave birth to an infant with a birth defect

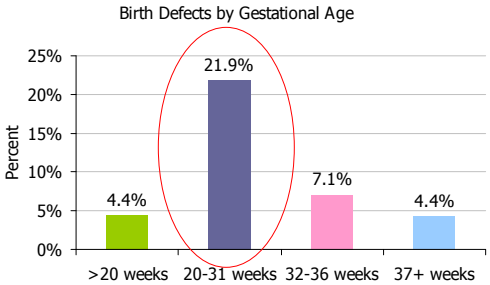


Birth Defects by Gestational Age

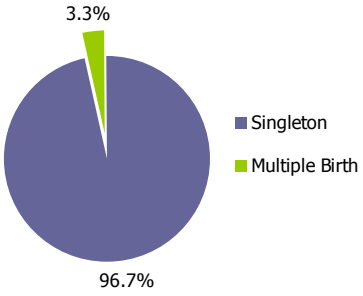


- Among the Michigan population, 1.9% of infants were very preterm

- Almost 22% of very preterm infants (20-31 weeks) had birth defects

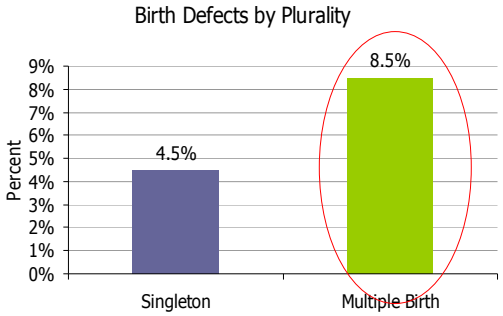


Birth Defects and Multiple Births

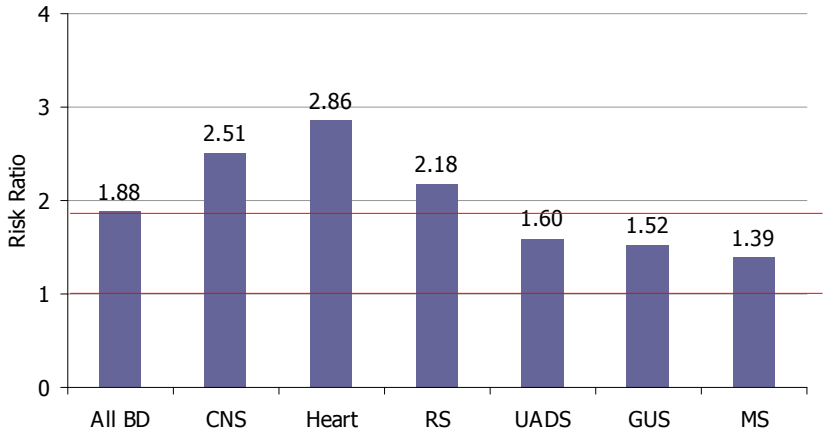


- Among all live births approximately 3.3% are multiple births

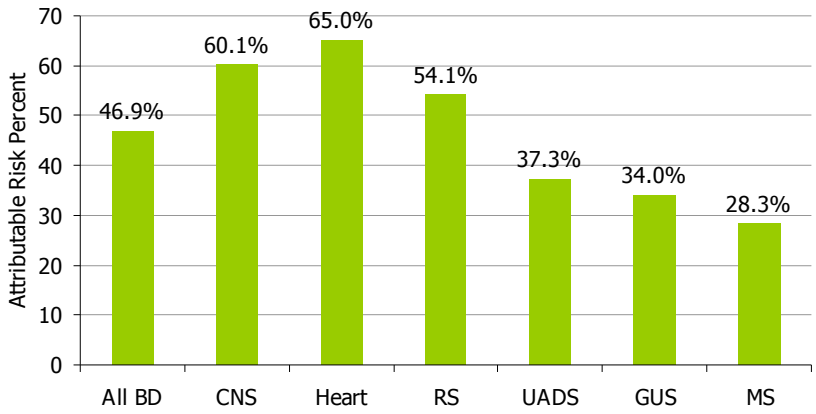
- High percent of birth defects in multiple births



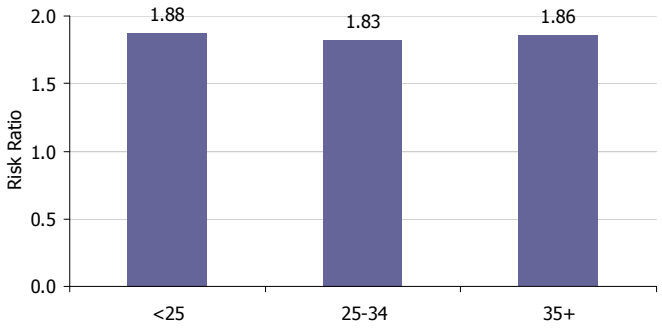
Risk of Multiple Births & Birth Defects



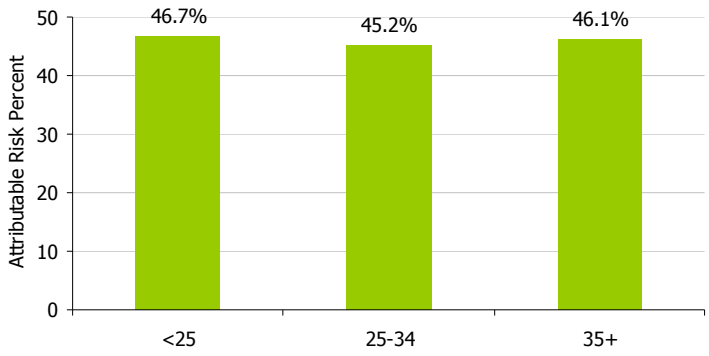
%Attributable Risk Percent



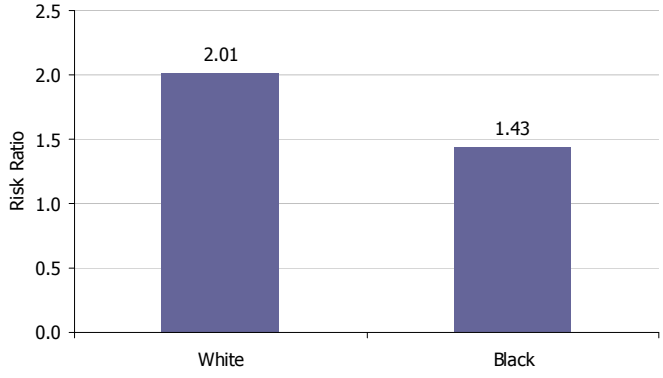
Risk Ratio Stratified by Age



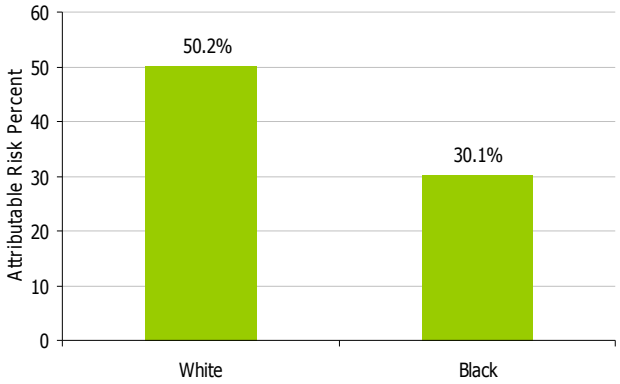
%AR of Multiple Births Stratified by Age



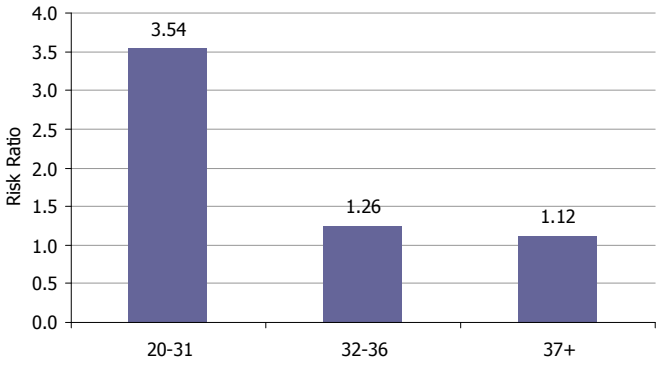
Risk Ratio Stratified by Race



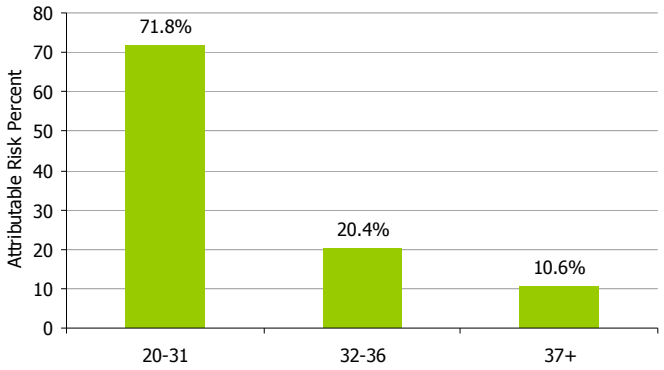
%Attributable Risk Stratified by Race



Risk Ratio Stratified by Gestational Age



%Attributable Risk Stratified by Gestational Age



Conclusion (1)

- Risk of birth defects is almost twice higher for multiple births
- By diagnostic groups, heart defects had the highest attributable risk (65% attributed to multiple births)
- The 2nd highest group were central nervous system, which encompasses neural tube defects
- Muscloskeletal system had the lowest risk attributed to multiple births

Conclusions (2)

- When stratified by age and race, the attributable risk percent was:
  - Almost the same across all age groups
  - Higher for White women
- However, these results are just based on simple stratification by demographic factors
- The findings suggest the need to further explore by including and adjusting for other factors (e.g. IVF drugs and embryo transfer, environmental, plurality number, etc.)

Limitations

- Reporting issues:
  - Lack of consistent reporting from different hospitals and other healthcare facilities
  - Possible false diagnoses
  - Lack of interstate exchange
- Data manipulation issues:
  - MBDR is constantly cleaned and updated
  - Difficult to replicate the same results at different time

Public Health Implications

- Increase education and counseling would enable women to make better decisions concerning their infant's health
- Target women who are 'at-risk'
  - Advanced maternal age
  - Undergoing fertility treatment

Questions/Comments?

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